

MET Products Enabled by WXXM

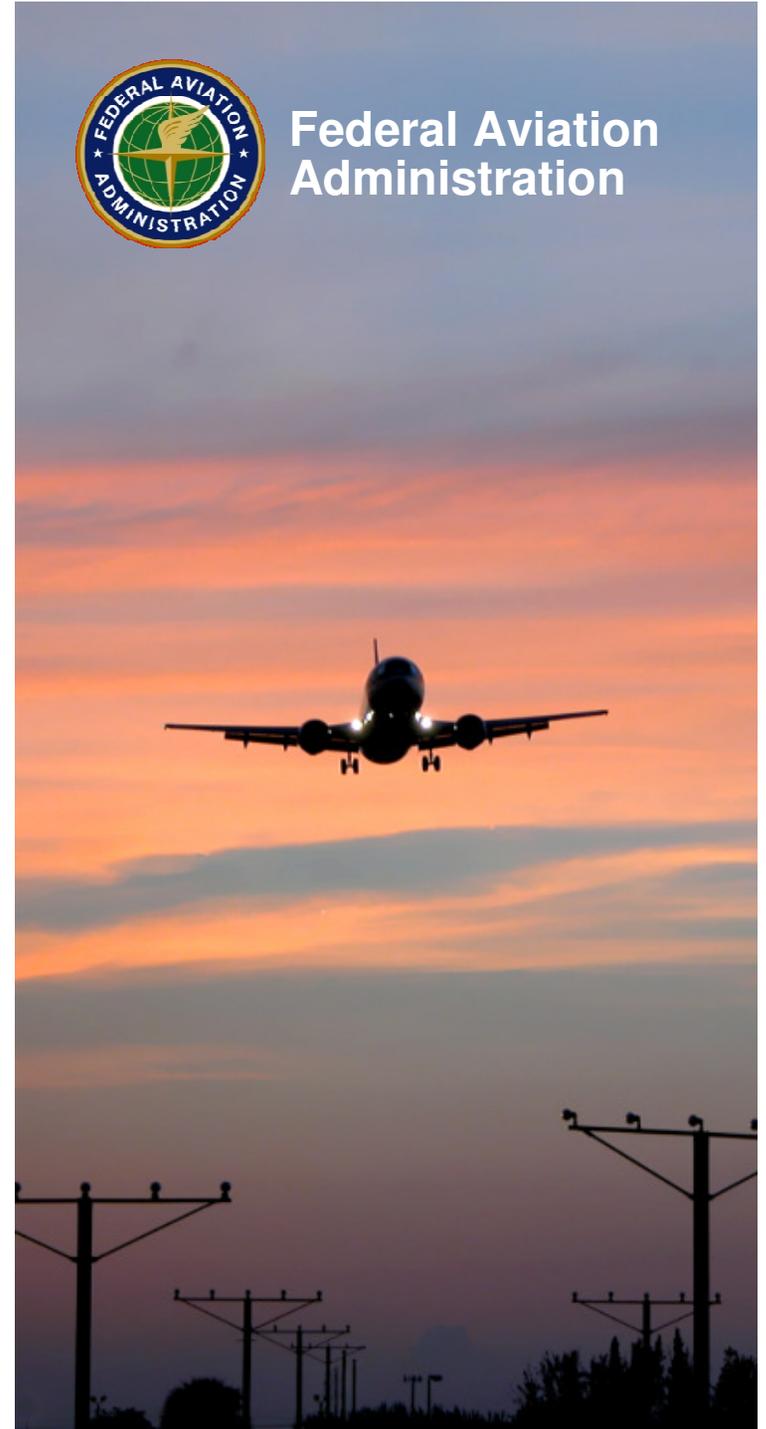
Presented to: Air Transportation Information
Exchange Conference

By: Dave Pace, NextGen Aviation Weather Group

Date: August 30, 2011



Federal Aviation
Administration

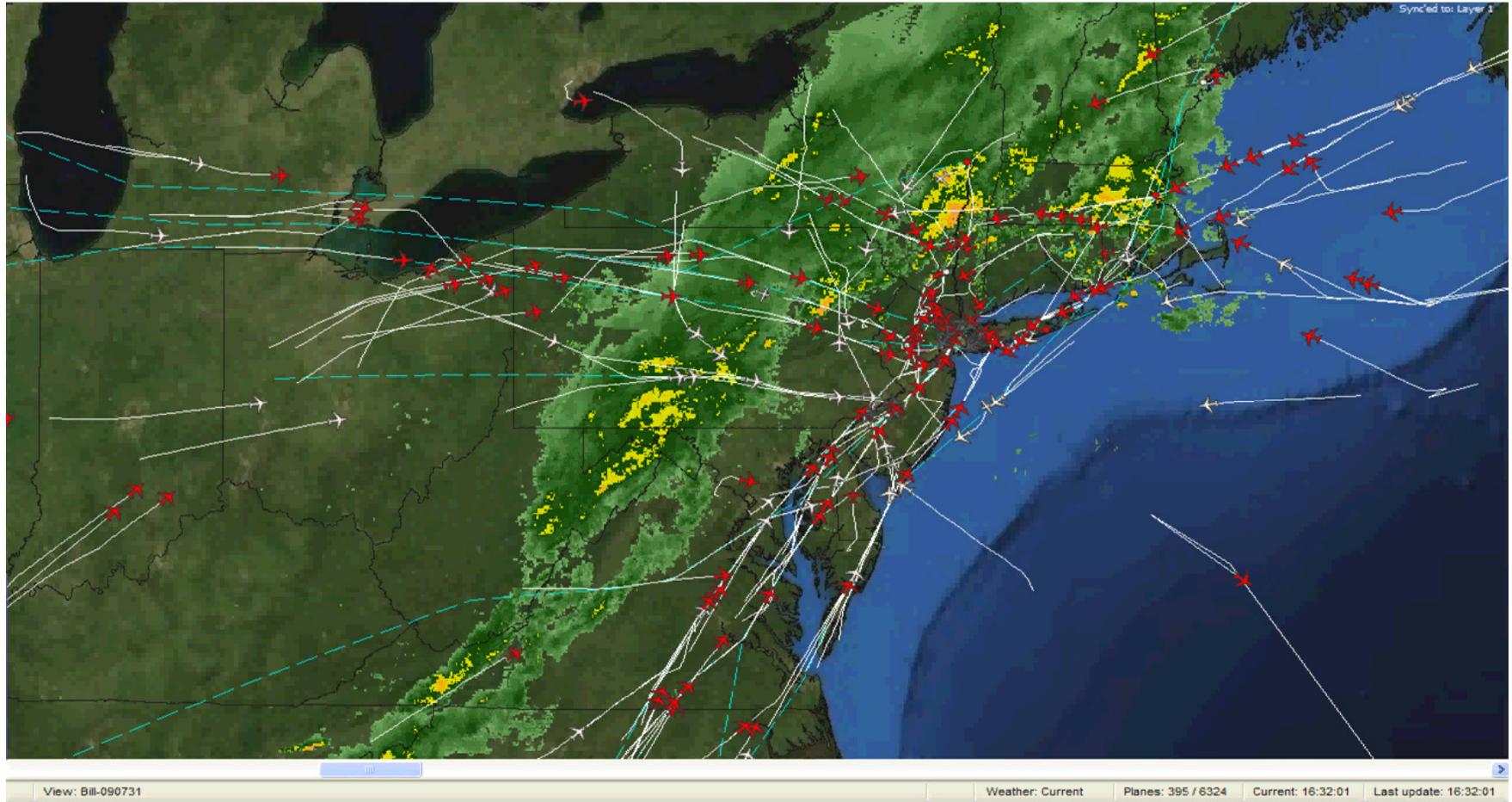


Overview

- **Common information**
- **Network-centric operations**
- **Integration into decisions**



Operational impact of weather



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Introduction

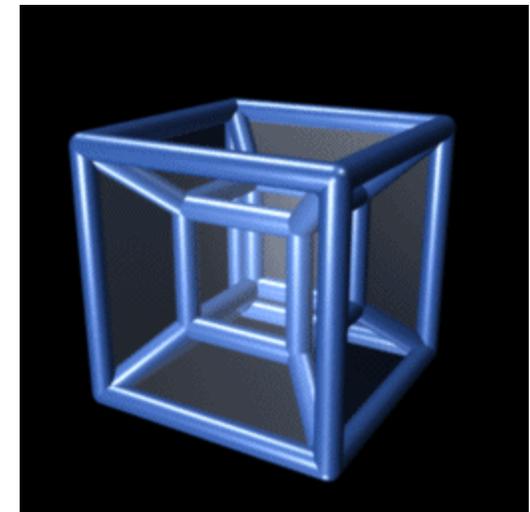
- **Weather in the United States causes 70 percent of air traffic delays at an annual cost of \$28 billion**
- **The Next Generation Air Transportation System (NextGen) will enable better operational decisions during weather situations**
- **Safe and efficient operations depend on enhanced aviation weather capabilities based on:**
 1. Common weather information for all decision makers and users
 2. Using network-enabled information dissemination for flexible and cost-efficient access to weather information
 3. Weather information being integrated into decision support tools



Common information:

The 4-Dimensional Weather Data Cube

- **Will contain:**
 - Continuously updated weather observations
 - High resolution analysis and forecast information
 - Turbulence
 - Icing
 - Convection
 - Ceiling and visibility
 - Winds (surface and aloft)
 - Others
- **All made commonly accessible to users**
- **Conceptual cube, not all in one location**
- **WXXM will be the standard exchange model**

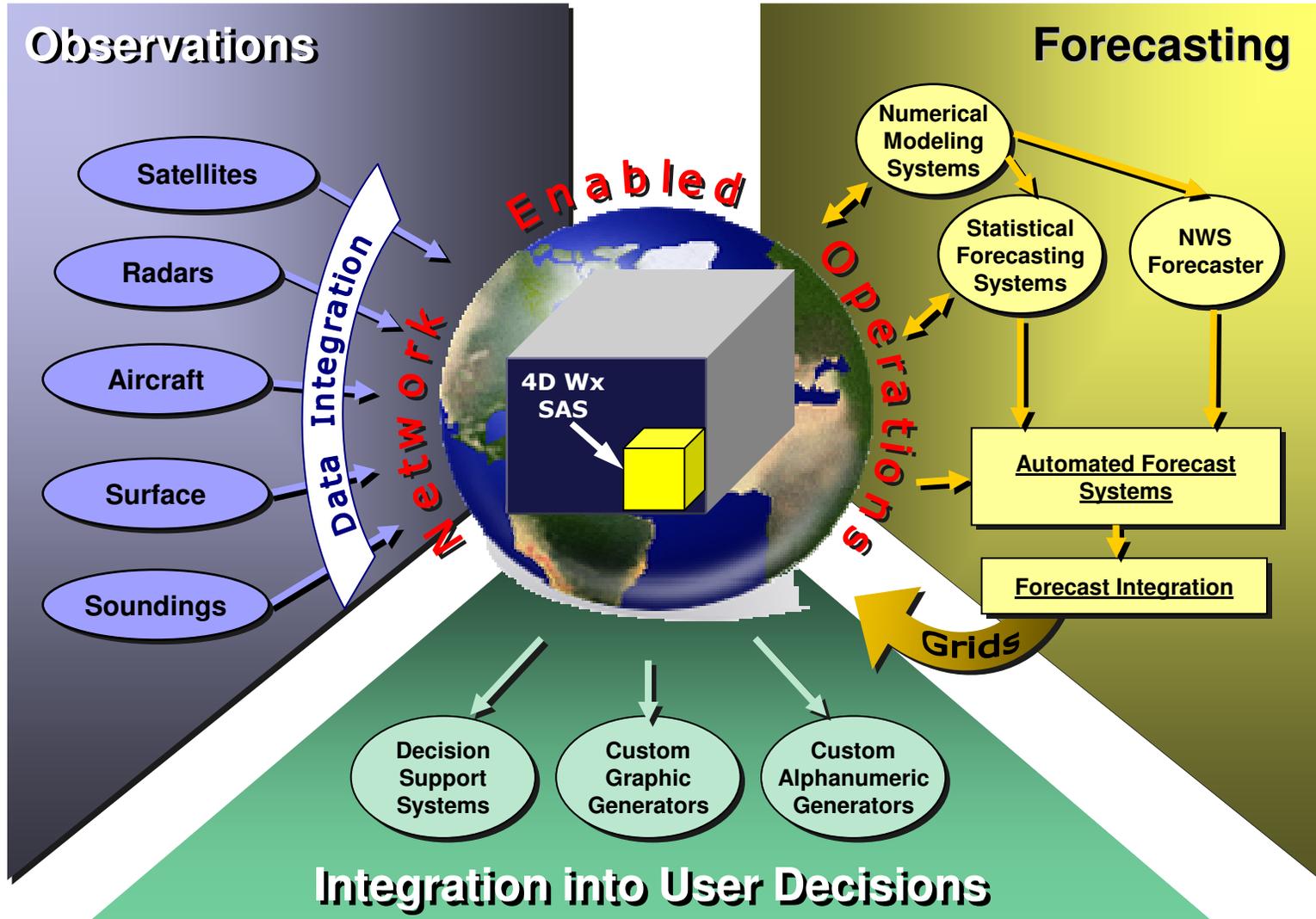


A special subset of the wx cube: 4-D Weather Single Authoritative Source

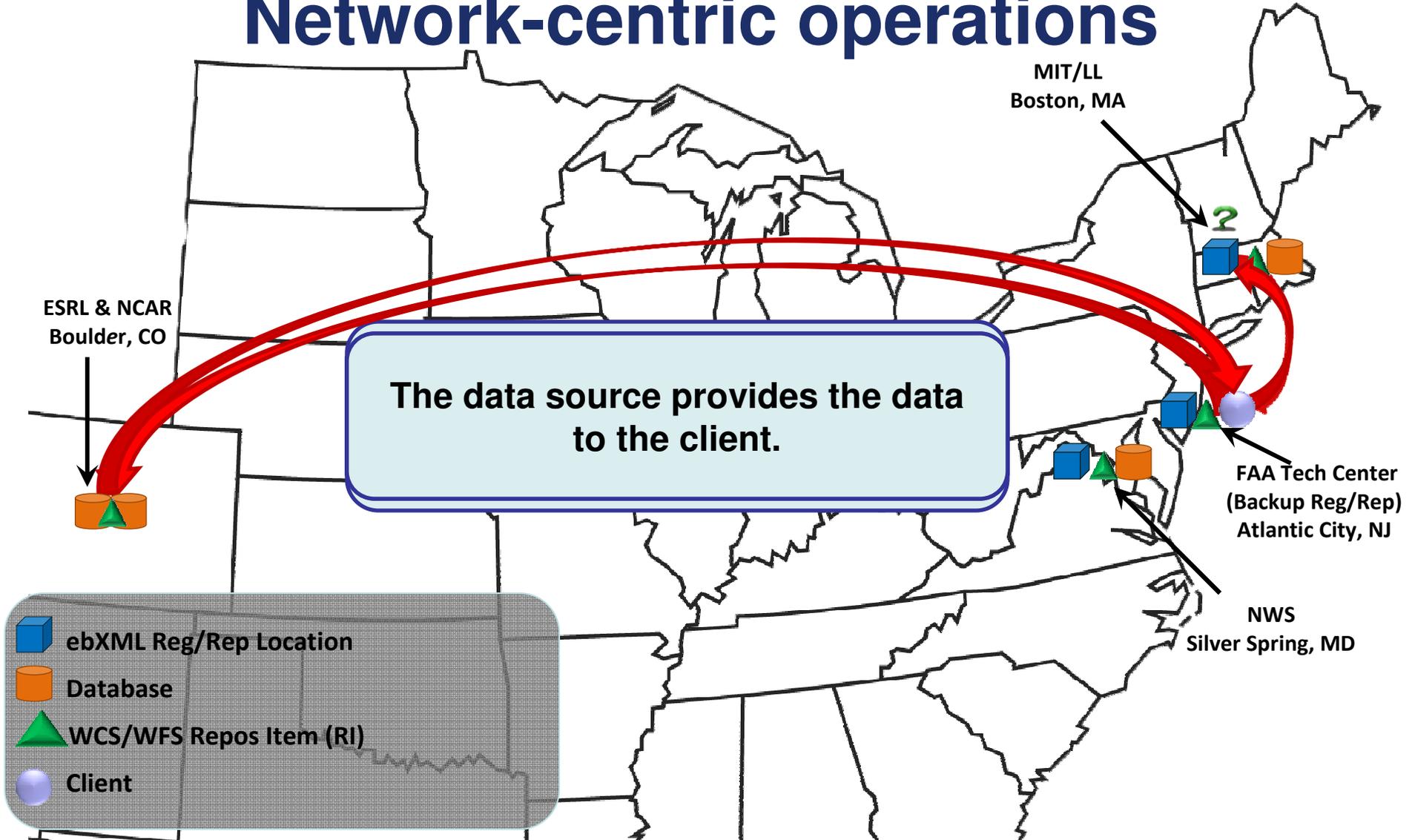
- **Is only a portion of the 4-D Weather Data Cube**
- **Provides a source for decisions by the ANSP (FAA in the US) in collaboration with airlines and other users**
 - May be a single chosen source
 - May be generated by intelligent merger of multiple sources
- **To be the basis for all aviation decisions by Air Traffic Management in the FAA**
- **Freely accessible by users**
- **All will know what the FAA is using for its weather decisions, but airlines and other users can choose to believe other sources**
- **A component of the NAS Common Reference**



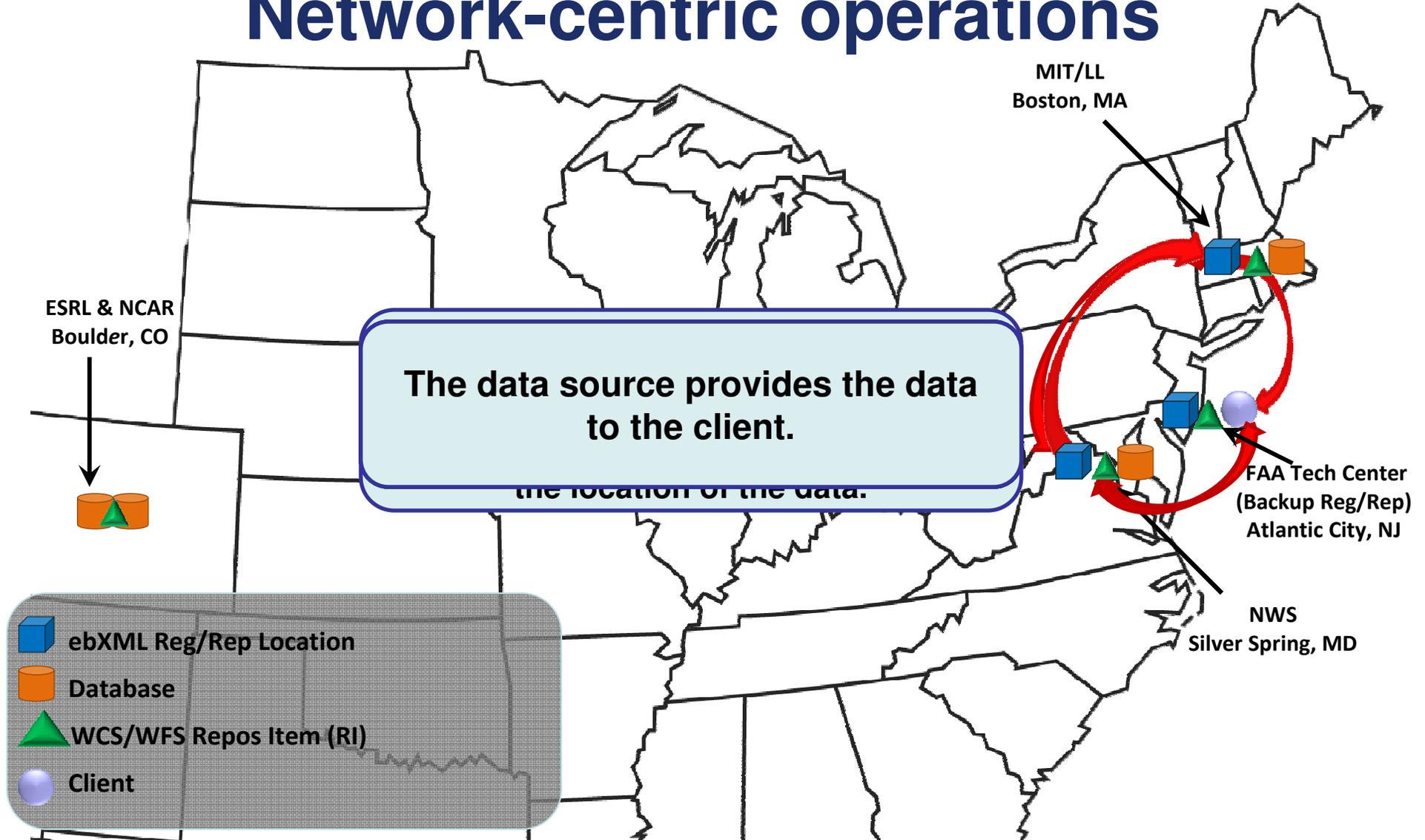
4-D Wx Cube conceptual model



Network-centric operations



Network-centric operations

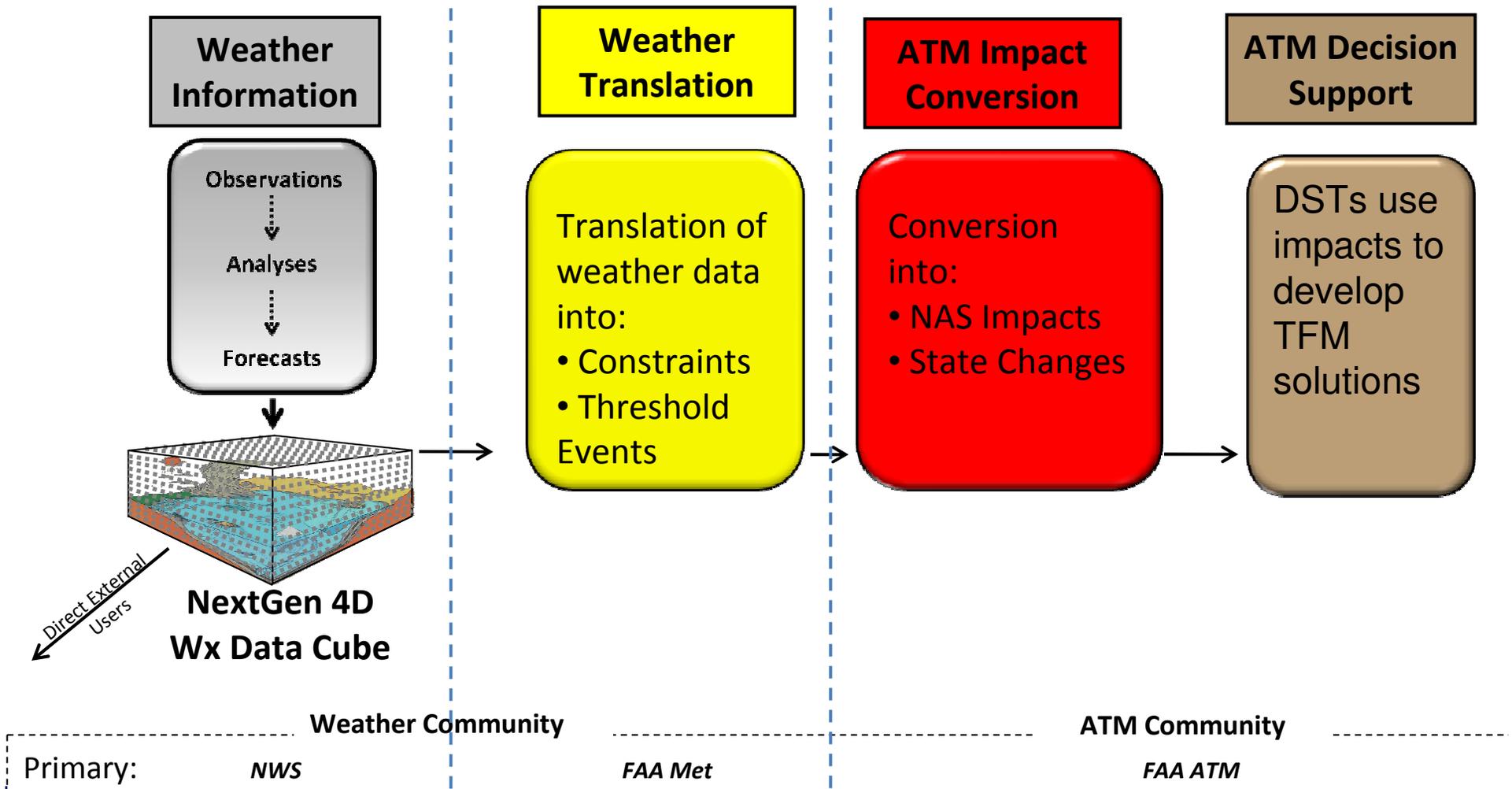


Integration into decisions

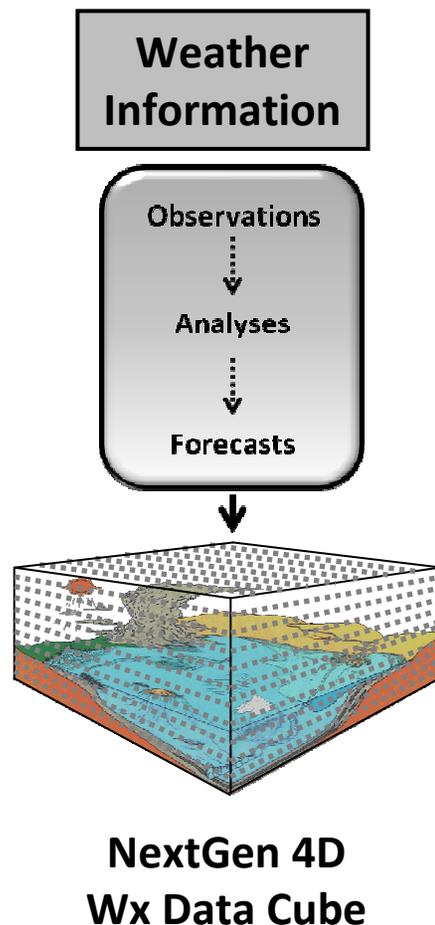
The only reason for the ANSP to be interested in weather is for making better decisions



NextGen ATM-Weather Integration



Weather Technical Interchange



Information in the NextGen 4D Wx Data Cube:

- Is to be WXXM compliant
- Is to be discoverable via the NNEW registry/repository

Weather Constraints Technical Interchange

Weather Translation

- Translation of weather data into:
- Constraints
 - Threshold Events

Information in the constraints virtual data base:

- Also is to be WXXM compliant by an extension to WXXM
- Also is to be discoverable via the NNEW registry/repository

ATM Impacts Technical Interchange

ATM Impact Conversion

Conversion
into:

- NAS Impacts
- State Changes

- For common use, impacts could also be stored in a virtual data base or “hypercube”:
- Would be discoverable via a registry/repository, similar to NNEW

Example: Flow Constrained Areas

Scenario:

- Convective weather is causing en route traffic to fly irregular tracks around storms, increasing controller workload
- Controllers cannot manage as many flights as they could on a fair weather day
- Controllers request aircraft not be fed to them as rapidly as normal
- This is achieved by increasing the miles in trail between aircraft
- Increased miles in trail means fewer aircraft per hour: less capacity
- Traffic managers establish a “flow constrained area” (FCA), meaning that the throughput capacity of the area will be considered reduced and some flights will be diverted elsewhere



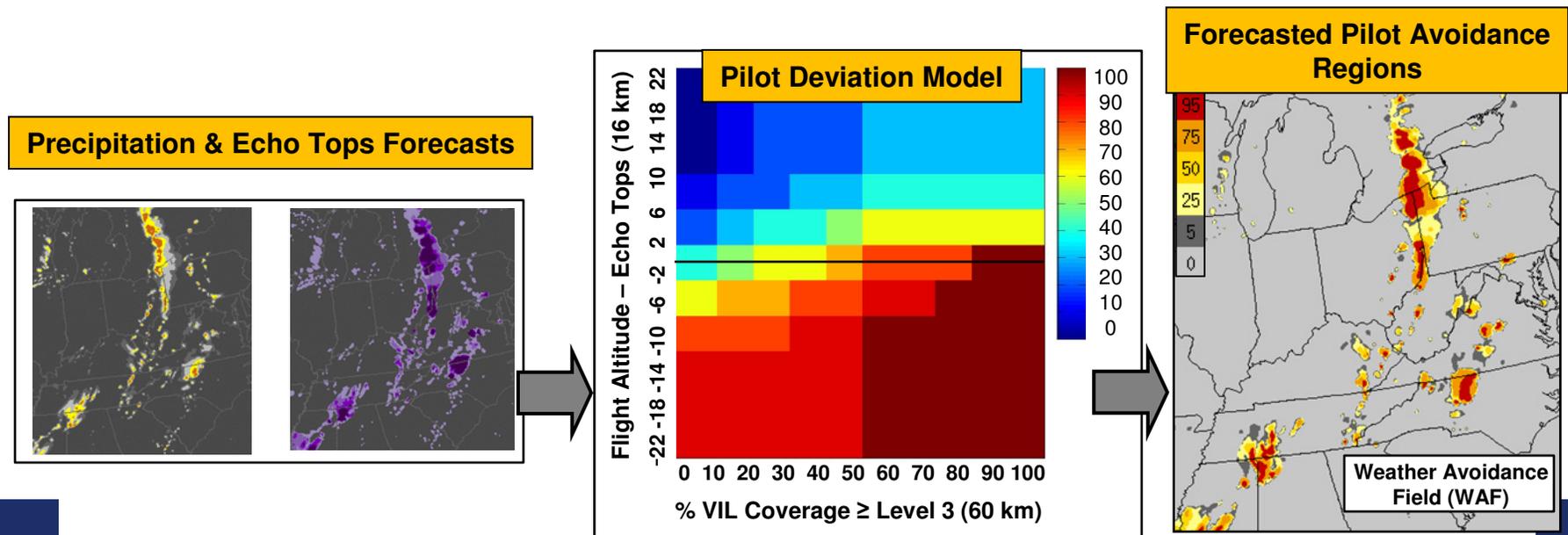
Example (cont)

- **Question:**
 - By how much should the capacity be reduced in the FCA?
- **To get the Answer:**
 1. Translate weather into constraints
 2. From constraints get the impact on capacity
 3. Use WXXM/NNEW as the dissemination model



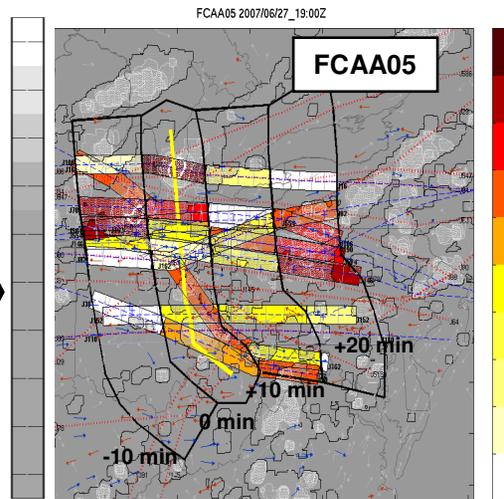
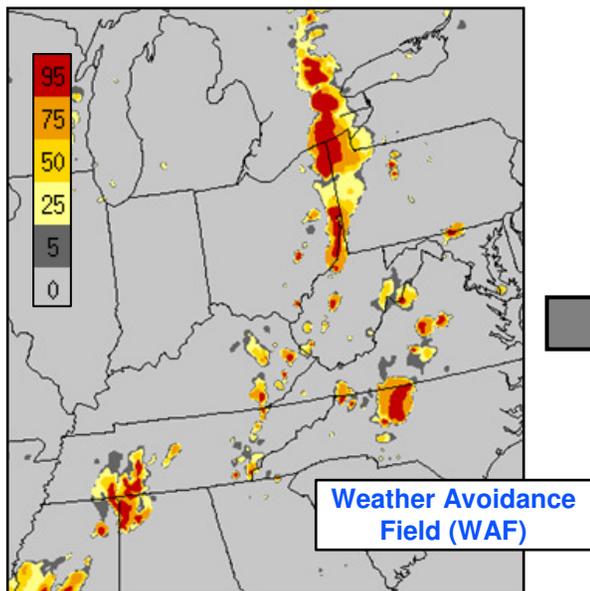
Step 1: Translate weather into constraints

- Knowing the constraint from the convective weather is about predicting pilot decisions
- Will they penetrate the weather, or will they divert around it.
- We have studied past pilot behavior and has drawn a correlation between storm intensity and storm tops
- Applying the correlation to the weather of the day produces the Weather Avoidance Field (WAF), which is the probability of pilots deviating around a storm



Step 2: From constraints get capacity

- Apply weather avoidance field (WAF) constraint prediction to corridors across an FCA
- Obtain the total capacity across the FCA

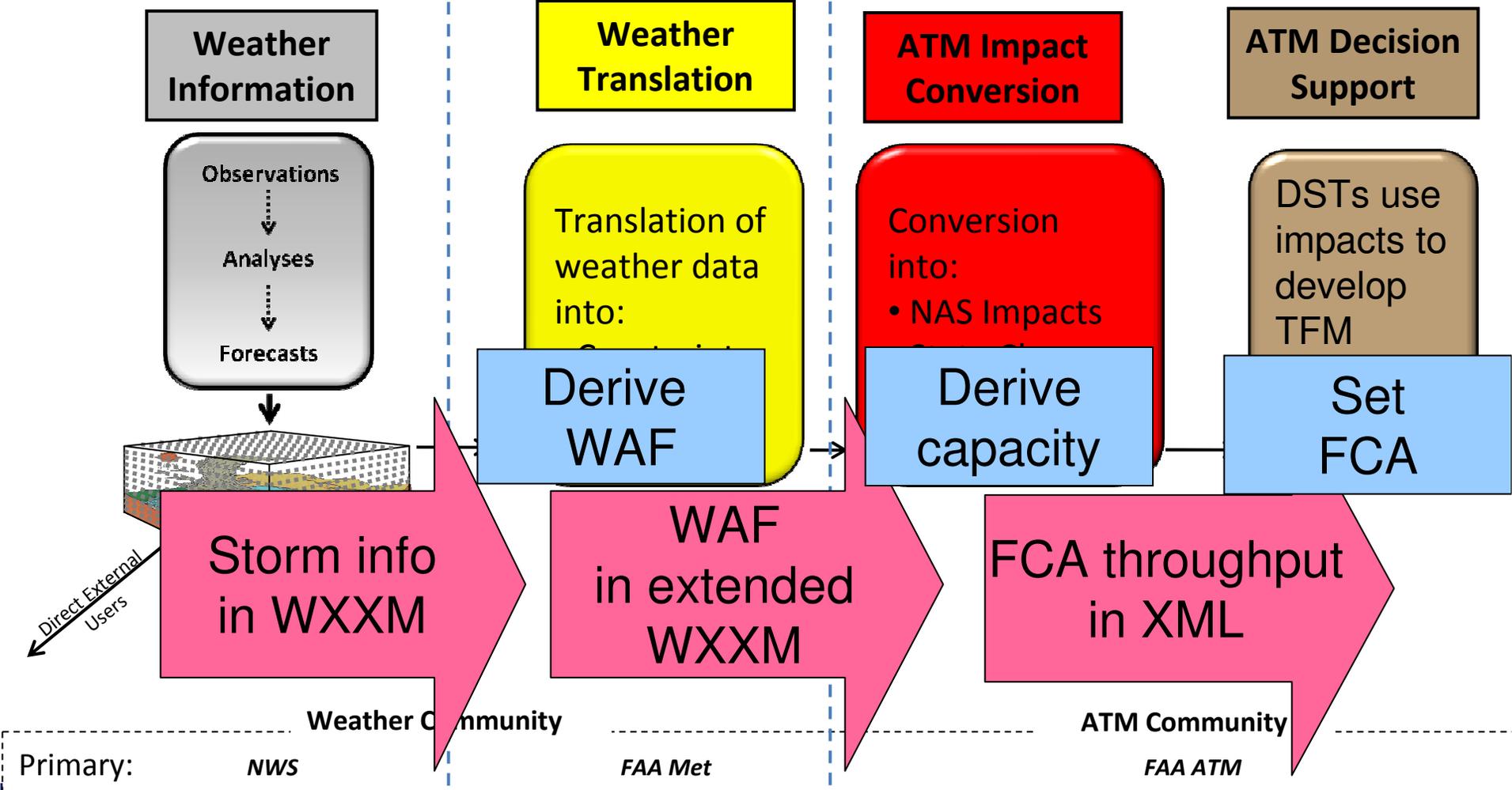


FCA Capacity Forecast Matrix

	11	12	13	14	15	16	17	18	19	20	21	22	23
11	81	96	78	38	72	85	78	68	40				
12		90	78	46	64	88	91	82	39	37			
13			89	57	71	76	88	84	66	28	20		
14				88	85	81	86	89	74	51	17	20	
15					96	88	85	90	70	47	16	19	49
16						90	61	65	68	28	6	13	30
17							77	67	69	63	20	9	17
18								78	61	54	59	19	3
19									50	36	29	33	20
20										0	10	13	16
21											11	5	7
22												6	4
23													6

Predicted Available A05 Capacity
 < 75% < 50%

Summary



Questions?

